How to deploy the Dell™ M8024 family of switches in a Cisco® Nexus® network

Principled Technologies®

A Principled Technologies white paper commissioned by Dell Inc.

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EXECUTIVE SUMMARY

Adding a Dell™ PowerConnect™ M8024 switch or a Dell M8024S LAN Module with a Dell PowerEdge™ M1000e modular blade enclosure to an existing network using a Cisco® infrastructure is a straightforward process. The addition of Simple Switch Mode on the Dell M8024 family of switches further simplifies the process, allowing integration into a Cisco network with minimal effort.

This Principled Technologies (PT) Guide explains the deployment process for the Dell PowerEdge M1000e modular blade enclosure with a Dell PowerConnect M8024 switch (see Figure 1) in an existing Cisco network. We tested two Dell PowerConnect M8024 switches in a variety of different network deployment scenarios with two Cisco Nexus® 5010 switches, and discovered that Simple Switch Mode is capable of automatically configuring the Dell PowerConnect M8024 switches to integrate with each scenario with minimal interaction from our technicians.

Figure 1: The Dell PowerConnect M8024 switch.

NOTE: We tested with the Dell PowerConnect M8024 switches, but all of our steps should apply to the Dell M8024S LAN Module, as well.

Features of Simple Switch Mode

Simple Switch Mode, or SSM, allows server administrators, or anyone with very limited expertise in configuring Ethernet switches, the ability to deploy a loop-free switching solution without having to configure the spanning tree protocol (STP) or design its integration into the existing environment.

The primary advantages of deploying SSM are as follows:

- Port Aggregation is easy to configure. Simply group internal ports and associate with external ports, assign VLANs (if required), and it's ready to go.
- SSM automatically configures multiple external ports into an LACP trunk group.
- By using Aggregator Groups, the feature provides loop-free operation without using STP.
- Port Aggregation is completely interoperable. Dynamic (via Link Aggregation Control Protocol (LACP)) and static link aggregation is supported on the external ports.

To enable Simple Switch Mode on a Dell PowerConnect M8024 switch, perform the following steps:

1. Log into the switch.
2. Select System→Operational Mode→Operational Mode Configuration.
3. In the Operational Mode Configuration screen, select Enable in the Simple Mode drop-down menu, and left-click Apply Changes.

NOTE: Dell M8024S LAN Modules are always in Simple Switch Mode, so you do not need to do these steps.

Sample scenarios

In the sections that follow, we discuss some of the new features of the hardware and software, give an overview of the deployment process, and present the following eight sample scenarios:

1. Plug and play using the Dell PowerConnect M8024 switch for blade deployment into an existing network after configuring Link

Aggregation Control Protocol (LACP) on Cisco Nexus 5010 switch ports.
2. Configuring VLANs on internal ports of the Dell PowerConnect M8024 switch, while configuring the Cisco Nexus 5010 switch to extend those VLANs in an external Nexus network.
3. Configuring Multiple VLANs per internal port to connect to the server NIC with Tag enabled. (An example of this would be supporting virtual machines (VMs) in the server scenario.)
4. Configuring multiple port aggregation groups (mapping aggregate groups to group-specific attached blade servers) and dedicating specific uplinks to carry that traffic to the Cisco network.
5. Adding VLANs in a multi-aggregate group configuration.
6. Setting up a meshed topology for redundancy.
7. Setting up a topology with Link Aggregation Group (LAG) failover.
8. Establishing access with vPC enabled across two Cisco Nexus 5010 switches.

The appendices to the Guide give detailed, step-by-step information on how to do the deployment and provide detailed configuration information on the hardware we used.

TESTING SCENARIOS

Our testing included establishing connections and utilizing sample features and functions of the Dell PowerConnect M8024 switch with the goal of showing the ease of deployment of the Dell PowerConnect M8024 switch and accompanying Dell hardware in a Cisco Nexus environment. The Dell blade switch operated in Simple Switch Mode as a port aggregator. We began each scenario with a fresh test bed, which included a Dell PowerEdge M710 blade server in the Dell PowerEdge M1000e modular blade enclosure connected with Dell PowerConnect M8024 switches. We include a network diagram showing the general configuration of our switches in our test bed for each scenario.

Scenario 1: Plug and play using the Dell PowerConnect M8024 switch for blade deployment into an existing network

In this section, we provide an overview of the plug-and-play process with the Dell PowerConnect M8024 switch, after configuring Link Aggregation Control Protocol (LACP) on Cisco Nexus 5010 switch ports. Dell's plug-and-play features with Simple Switch Mode allow for quick integration of Dell blade switch into a network. We provide detailed instructions in Appendix A.

1. On the Cisco Nexus 5010 switch, set up a four-port port channel with LACP using the ports that will be connected to Dell PowerConnect M8024 switch.
2. Connect cables from the Cisco Nexus 5010 switch to the Dell PowerConnect M8024 switch. The Dell PowerConnect M8024 switch will automatically create a Link Aggregation Group (LAG) and establish network connectivity for the blade servers into the existing network.

NOTE: Because the Dell PowerConnect M8024 switch forms the LAG as you cable up the ports, cabling will not create loops, removing the need for STP.

Figure 2 illustrates the completed configuration for Scenario 1.

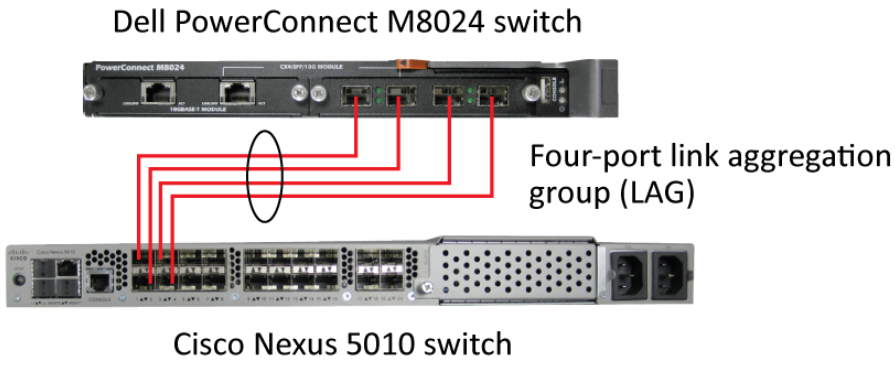

Figure 2: Graphic representation of Scenario 1.

Scenario 2: Configuring VLANs on the internal ports of the Dell PowerConnect M8024 switch

In this section, we provide an overview of configuring the VLANs on the internal ports of the Dell PowerConnect M8024 switch, while configuring those on the Cisco Nexus 5010 switch to extend those VLANs in the external Cisco Nexus network. VLANs allow for traffic isolation and for granular quality of service (QoS) control over simple subnetting, and Dell switches with Simple Switch Mode enabled offer quick and easy VLAN configuration. We provide detailed instructions in Appendix A.

1. On the Dell PowerConnect M8024 switch, enter the Internal Port VLAN configuration screen, select a port, and change the default Untagged VLAN (we changed port 1/xg1 to VLAN 101).
2. On the Cisco Nexus 5010 switch, create a four-port channel group with LACP and Trunking (VLAN tagging) enabled.
3. Allow VLAN 101 through the new port channel.
4. Connect the cables from the ports of the port channel group to the Dell PowerConnect M8024 Switch. The Dell PowerConnect M8024 switch will automatically make a four-port LAG with VLAN tagging enabled and tag all communications from the designated internal port as VLAN 101.

Figure 3 illustrates the completed configuration for Scenario 2.

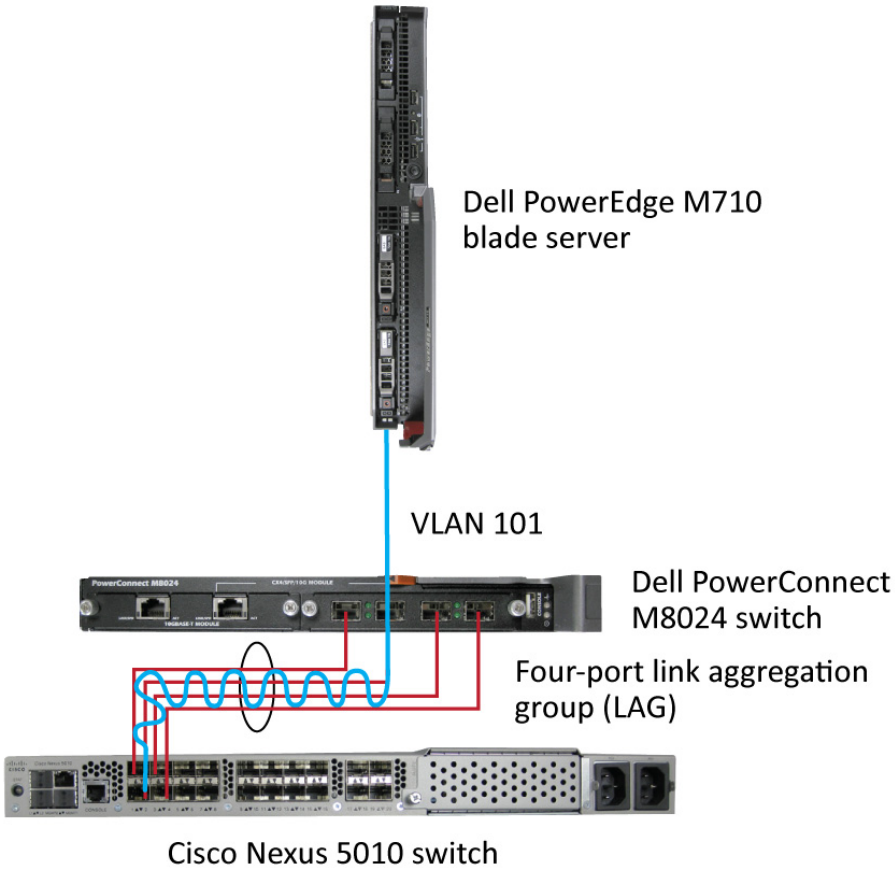

Figure 3: Graphic representation of Scenario 2.

Scenario 3: Configuring multiple VLANs per internal port to connect to a server NIC with tagging enabled

In this section, we provide an overview of configuring multiple VLANs per internal port to connect to a server NIC with VLAN tagging enabled, which is useful for management of VMs. We provide detailed instructions in Appendix A.

1. On the Dell PowerConnect M8024 switch, enter the Internal Port VLAN configuration screen, select a port, and add several tagged VLANs (we changed port 1/xg1 to include VLANs 101-104).
2. On the Cisco Nexus 5010 switches, create a four-port channel group with LACP and Trunking (VLAN tagging) enabled.
3. Allow VLANs 101-104 through the new port channel.
4. Connect the cables from the ports of the port channel group to the Dell PowerConnect M8024 switch. The Dell PowerConnect M8024 switch will automatically make a four-port LAG with VLAN tagging enabled. From now on, you can modify VM communications so that you can tag them to various VLANs.

Figure 4 illustrates the completed configuration for Scenario 3.

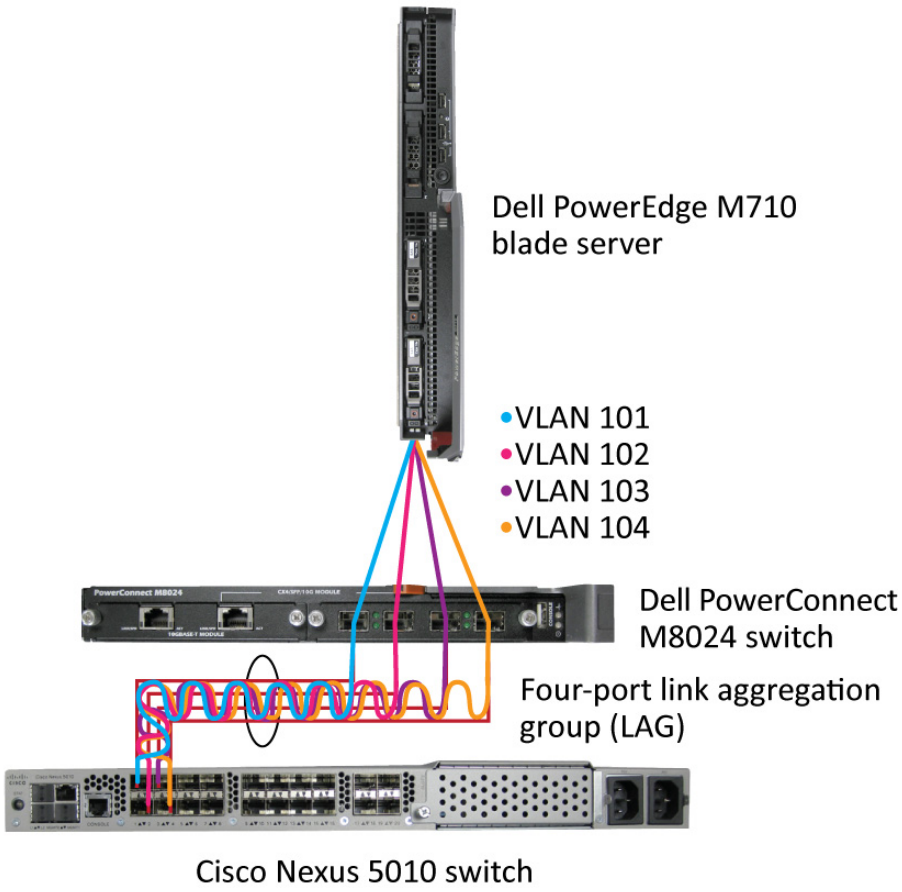

Figure 4: Graphic representation of Scenario 3.

Scenario 4: Configuring multiple Port Aggregation Groups and dedicating specific Uplinks

In this section, we provide an overview of configuring multiple Port Aggregation Groups (AGs to group specific attached blade servers) and dedicating specific Uplinks to carry that traffic to the Cisco Nexus network. Doing this allows us to physically separate traffic for easier administration. We provide detailed instructions in Appendix A.

1. On the Dell PowerConnect M8024 switch, enter the Port Configuration screen, and change the group ID of the ports you desire to Group 2 (we changed ports 1/xg9-1/xg16 and ports 1/xg23-1/xg24 to Group 2).
2. On the Cisco Nexus 5010 switch, create two two-port channel groups with LACP enabled.
3. Connect the cables. The Dell PowerConnect M8024 switch will automatically make two two-port LAGs, separating the traffic

from between the two groups created earlier. The traffic from the blade servers that are connected to internal ports belonging to Group 1 will use LAG, including those external ports that are part of that group. This applies to the blade servers in Group 2 as well.

Figure 5 illustrates the completed configuration for Scenario 4.

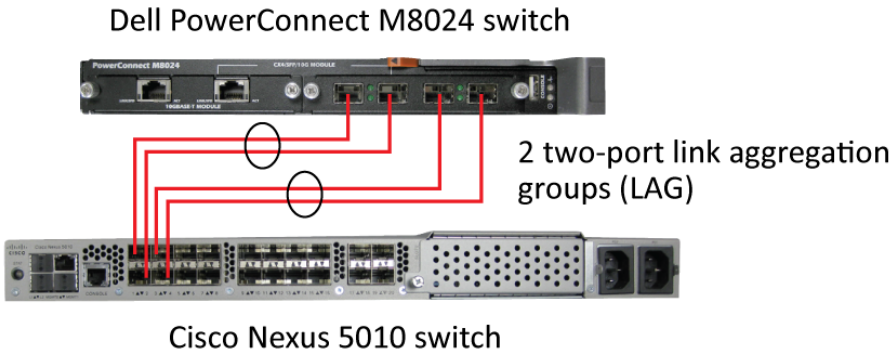

Figure 5: Graphic representation of Scenario 4.

Scenario 5: Adding VLANs in a multi-AG configuration

In this section, we provide an overview of adding VLANs in a multi-AG configuration, which combine the advantages of virtual network administration with physical network separation. We provide detailed instructions in Appendix A.

1. On the Dell PowerConnect M8024 switch, enter the Port Configuration screen, and change the group ID of ports to Group 2 (we changed ports 1/xg9-1/xg16 and ports 1/xg23-1/xg24 to Group 2).
2. Enter the Internal Port VLAN configuration screen, select a port, and add several tagged VLANs (we changed port 1/xg1 to include VLANs 101-102 and port 1/xg9 to include VLANs 103-104).
3. On the Cisco Nexus 5010 switches, create two two-port channel groups with LACP enabled. Make sure that the two port channels include the VLANs you configured earlier (we configured VLANs 101-102 for the first port channel and VLANs 103-104 for the second port channel).
4. Connect the cables. The Dell PowerConnect M8024 switch will automatically make two two-port LAGs, separating the traffic from between the two groups created earlier, while allowing for further segregation through VLANs.

Figure 6 illustrates the completed configuration for Scenario 5.

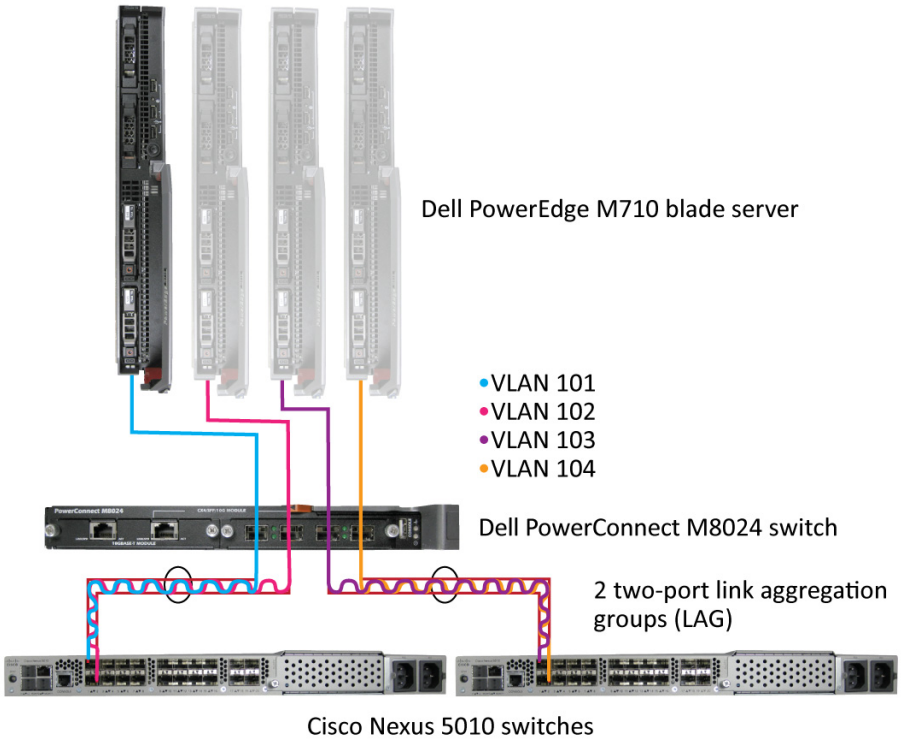

Figure 6: Graphic representation of Scenario 5.

Scenario 6: Setting up a fully meshed topology

In this section, we provide an overview of setting up a fully meshed topology while spanning tree protocol (STP) is enabled on an existing network. STP allows for redundant connections in switches without creating loops, and the Dell PowerConnect M8024 switches can automatically integrate themselves into an STP network. The Dell PowerConnect M8024 in Simple Switch Mode uses LAGs to prevent loops, but allows Cisco Nexus switches to handle STP states. We provide detailed instructions in Appendix A.

1. On the first Cisco Nexus 5010 switch, set the spanning tree priority so that it is the root.
2. On the second Cisco Nexus 5010 switch, set the spanning tree priority so the tree will default to it as the secondary root in the event of failure.
3. Connect the cables between all switches. The Dell PowerConnect M8024 switches will automatically integrate into the Cisco spanning tree network.

Figure 7 illustrates the completed configuration for Scenario 6 and the network created via STP. The first Cisco Nexus 5010 switch will act as the root switch in the tree and block the redundant ports.

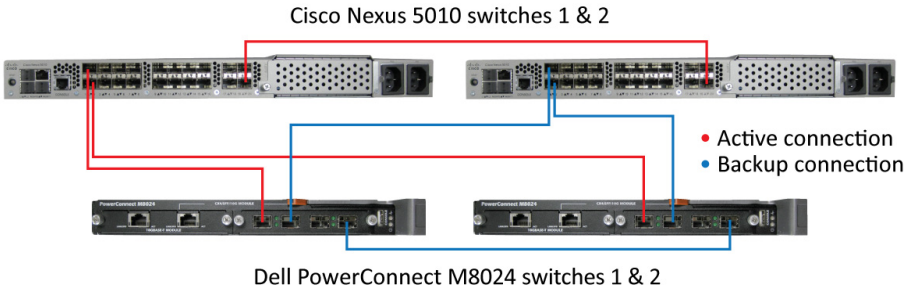

Figure 7: Graphic representation of Scenario 6.

In the event of a cable failure, the root switch will enable the appropriate ports to maintain connections with all other switches. Figure 8 illustrates the new logical network created in the event of a cable failure.

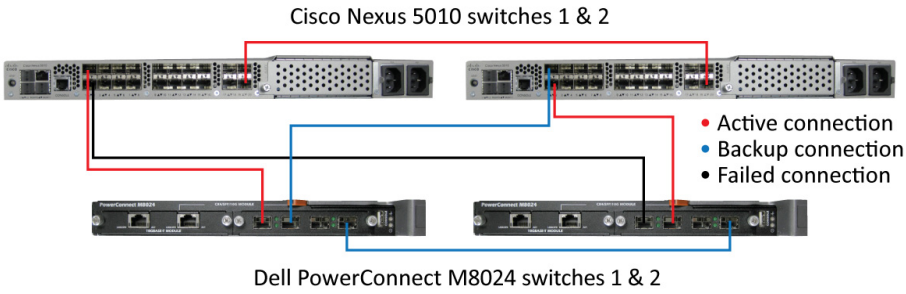
Cisco Nexus 5010 switches 1 & 2
Active connection
Backup connection
Failed connection
Dell PowerConnect M8024 switches 1 & 2

Figure 8: Graphic representation of the modified logical network after a cable failure.

Scenario 7: Setting up a straight-through topology with LAG failover

In this section, we provide an overview of setting up a straight-through topology with LAG failover. Simple Switch Mode LAG failover allows Dell switches to automatically change from the primary to the backup LAG in the event of a port failure, reducing potential downtime. We provide detailed instructions in Appendix A.

1. On the Dell PowerConnect M8024 switch, enter the Port Configuration screen, and change the Lag Role of ports to Secondary (we changed ports 1/xg23-1/xg24 to Secondary).
2. On the Cisco Nexus 5010 switches, create two two-port channel groups with LACP enabled.
3. Connect the cables. The Dell PowerConnect M8024 switch will automatically make a two-port LAG with a secondary backup LAG that it will failover to in the event of a cable or port failure.

Figure 9 illustrates the completed configuration for Scenario 7.

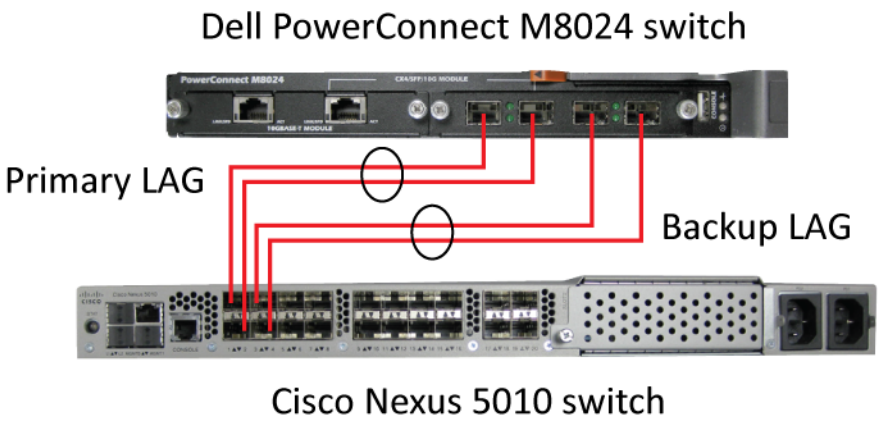

Figure 9: Graphic representation of Scenario 7.

Scenario 8: Establishing access with vPC enabled across the Cisco Nexus 5010 switches

In this section, we provide an overview of establishing access with vPC enabled across Cisco Nexus 5010 switches. vPC, or Virtual PortChannel, is a Cisco technology that allows multiple switches to present themselves as one switch, combining link aggregation with switch redundancy. This allows for multiple-port link aggregation across switches. In our example scenario, each Dell PowerConnect M8024 switch maintains a 4-port link aggregation with the Cisco switches, 2 ports in each switch. We provide detailed instructions in Appendix A.

1. On each Dell PowerConnect M8024 switch, enter the Internal Port VLAN configuration screen, select a port, and change the default Untagged VLAN (we changed ports 1/xg1 and 1/xg8 to VLAN 101).
2. On the each Cisco Nexus 5010 switch, set up the vPC domain and keepalive ports, and create the PortChannel for the downstream switch (the Dell PowerConnect M8024 switch).
3. Cable the two Cisco Nexus 5010 switches together using the peer links you configured.
4. Cable the Cisco Nexus 5010 switches to the Dell PowerConnect M8024 switch. The Dell PowerConnect M8024 switch will automatically make a LAG with the Cisco Nexus 5010 switches and treat the two switches as one.

Figure 10 illustrates the completed configuration for Scenario 8.

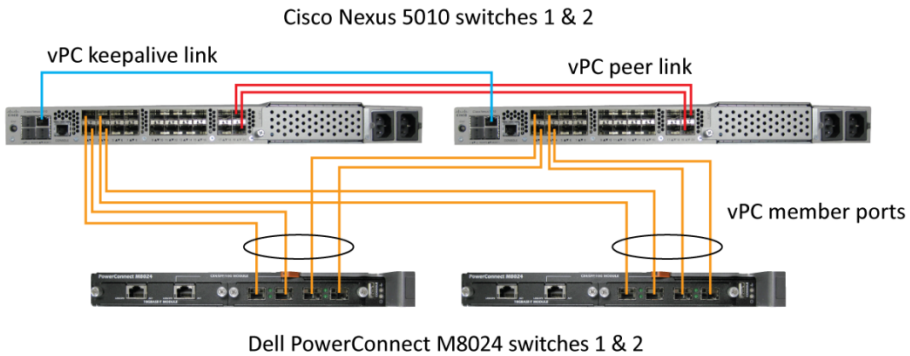

Figure 10: Graphic representation of Scenario 8.

APPENDIX A – DETAILED SCENARIO METHODOLOGY

In this appendix, we provide detailed descriptions of the test scenarios we followed and screenshots for each step, as appropriate. In each scenario, we assume that the associated switches are at factory default configurations.

Scenario 1: Plug and play using the Dell PowerConnect M8024 switch for blade deployment into an existing network

On the Dell PowerConnect M8024 switch

1. Log into the switch.
2. Select System→Operational Mode→Operational Mode Configuration.
3. In the Operational Mode Configuration screen, select Enable in the Simple Mode drop-down menu, and left-click Apply Changes (see Figure 11).

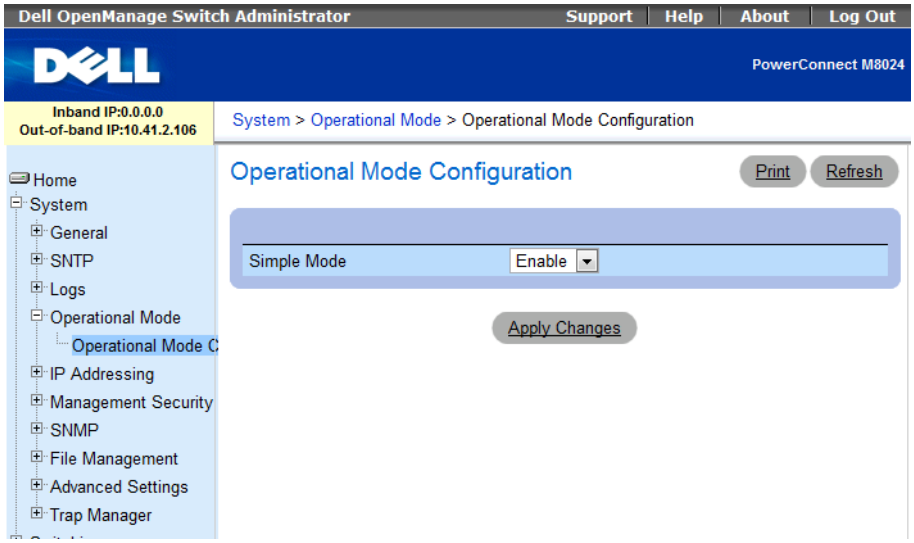

Figure 11: Simple Mode configuration on the Dell PowerConnect M8024 switch.

On the Cisco Nexus 5010 switch

1. Log into the switch.
2. Type the following commands into the switch (see Figure 12):

```
configure terminal
feature lacp
interface ethernet 1/1-4
channel-group 1 mode active
```

```
cswitch1# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
cswitch1(config)# feature lacp
cswitch1(config)# interface ethernet 1/1-4
cswitch1(config-if-range)# channel-group 1 mode active
cswitch1(config-if-range)#
```

Figure 12: Configuring a port channel on the Cisco Nexus 5010 switch.

3. Connect cables from the Cisco Nexus 5010 switch to the Dell PowerConnect M8024 switch.

Scenario 2: Configuring VLANs on the internal ports of the Dell PowerConnect M8024 switch

On the Dell PowerConnect M8024 switch

1. Log into the switch.
2. Select System→Operational Mode→Operational Mode Configuration.
3. In the Operational Mode Configuration screen, select Enable in the Simple Mode drop-down menu, and left-click Apply Changes (see Figure 13). The switch will reset after this and you will need to log in again.

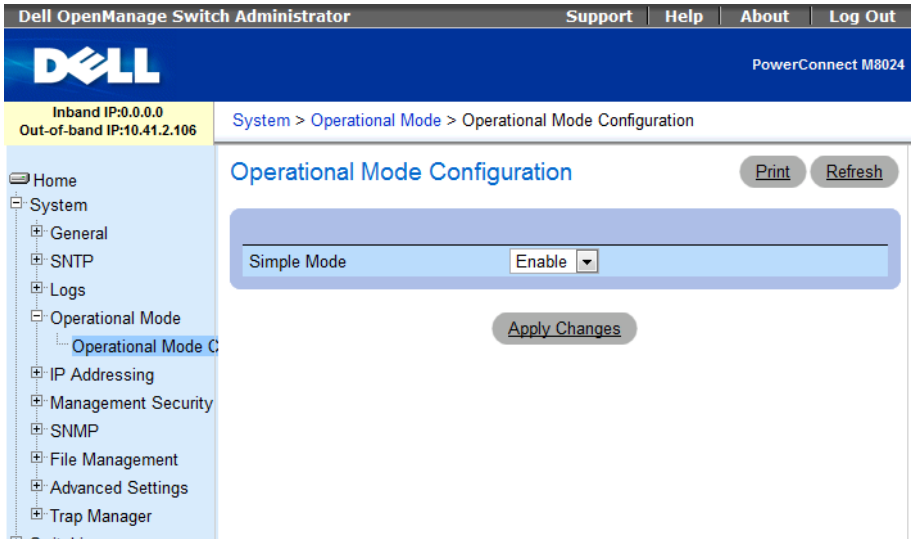

Figure 13: Simple Mode configuration on the Dell PowerConnect M8024 switch.

4. Select Switching→Port Aggregator→Internal Port VLAN Configuration.
5. In the Internal-Port drop-down menu, select a port (we chose 1/xg1). (See Figure 14.)

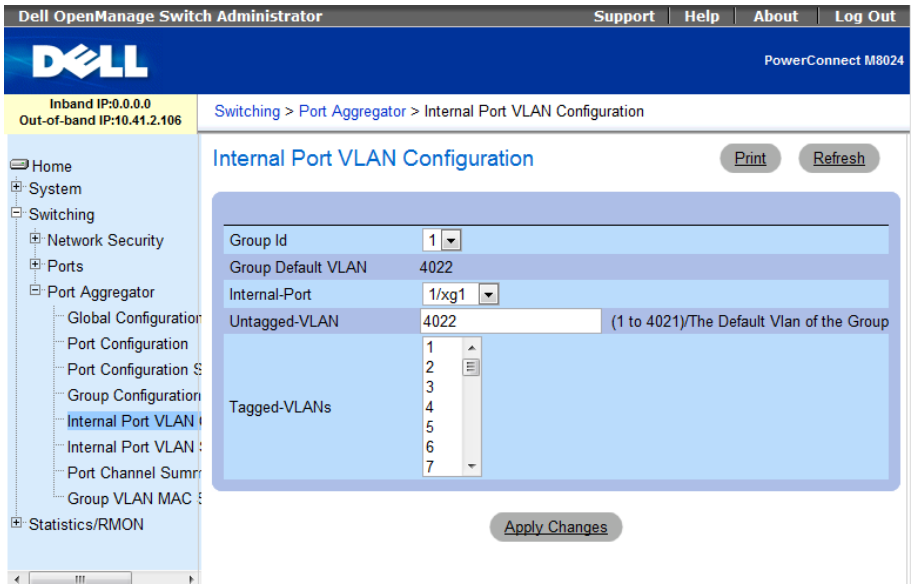

Figure 14: Internal Port VLAN Configuration on the Dell PowerConnect M8024 switch.

6. In the Untagged-VLAN textbox, write a VLAN (we chose 101), and left-click Apply Changes (see Figure 15.)

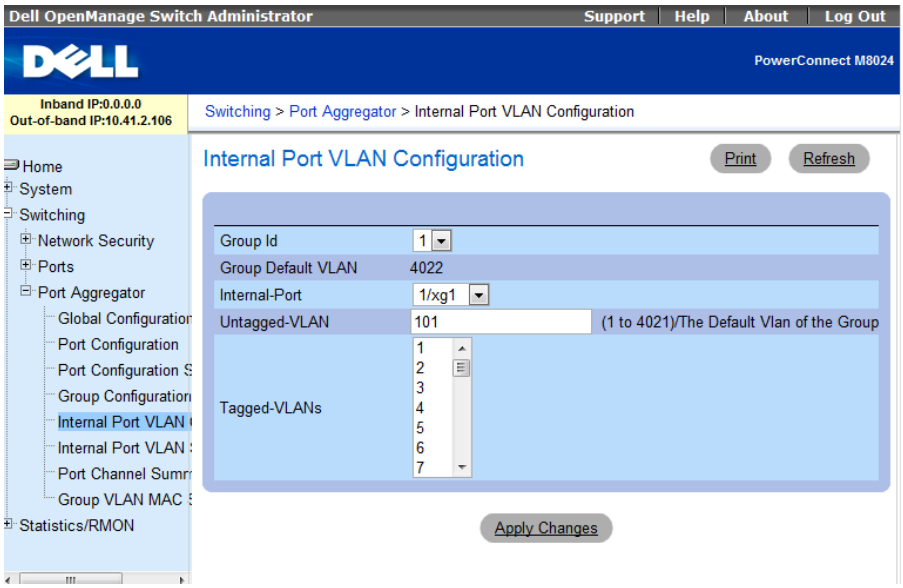

Figure 15: Selecting a VLAN in Internal Port VLAN Configuration on the Dell PowerConnect M8024 switch.

On the Cisco Nexus 5010 switch

1. Log into the switch.
2. Type the following commands into the switch (see Figure 16):

```
configure terminal
feature lacp
vlan 101
```

```
exit
interface port-channel 1
interface ethernet 1/1-4
channel-group 1 mode active
exit
switchport mode trunk
switchport trunk allowed vlan 101
end
```

```
cswitch1# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
cswitch1(config)# feature lacp
cswitch1(config)# vlan 101
cswitch1(config-vlan)# exit
cswitch1(config)# interface ethernet 1/1-4
cswitch1(config-if-range)# channel-group 1 mode active
cswitch1(config-if-range)# exit
cswitch1(config)# interface port-channel 1
cswitch1(config-if)# switchport mode trunk
cswitch1(config-if)# switchport trunk allowed vlan 101
cswitch1(config-if)# end
```

Figure 16: Configuring a port channel with Trunking on the Cisco Nexus 5010 switch.

3. Connect the cables from the Cisco Nexus 5010 switch to the Dell PowerConnect M8024 switch.

Scenario 3: Configuring multiple VLANs per internal port to connect to a server NIC with tagging enabled

On the Dell PowerConnect M8024 switch

1. Log into the switch.
2. Select System→Operational Mode→Operational Mode Configuration.
3. In the Operational Mode Configuration screen, select Enable in the Simple Mode drop-down menu and left-click Apply Changes (see Figure 17). The switch will reset after this and you will need to log in again.

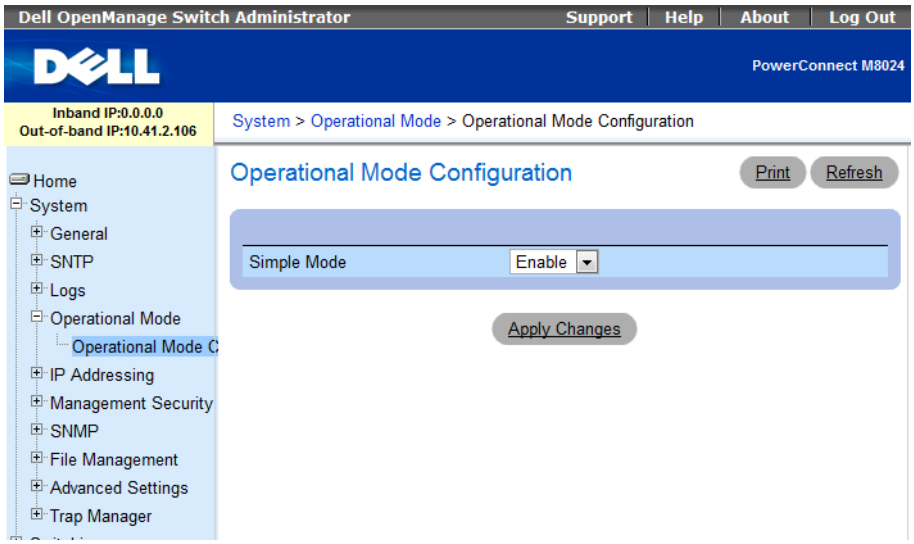

Figure 17: Simple Mode configuration on the Dell PowerConnect M8024 switch.

4. Select Switching→Port Aggregator→Internal Port VLAN Configuration.
5. In the Internal-Port drop-down menu, select a port (we chose 1/xg1). (See Figure 18.)

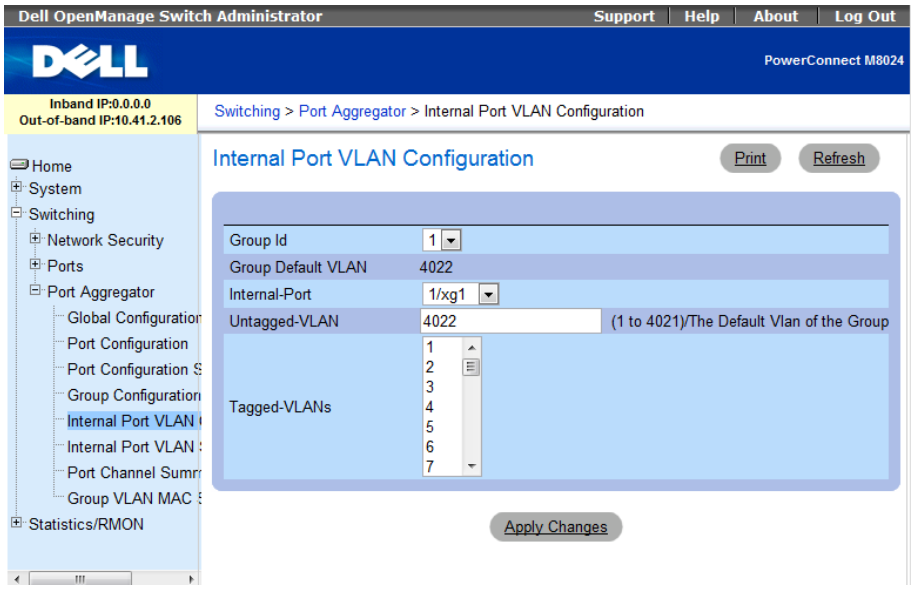

Figure 18: Internal Port VLAN Configuration on the Dell PowerConnect M8024 switch.

6. In the Tagged-VLANs box, select your VLANs (we chose 101-104), and left-click Apply Changes (see Figure 19).

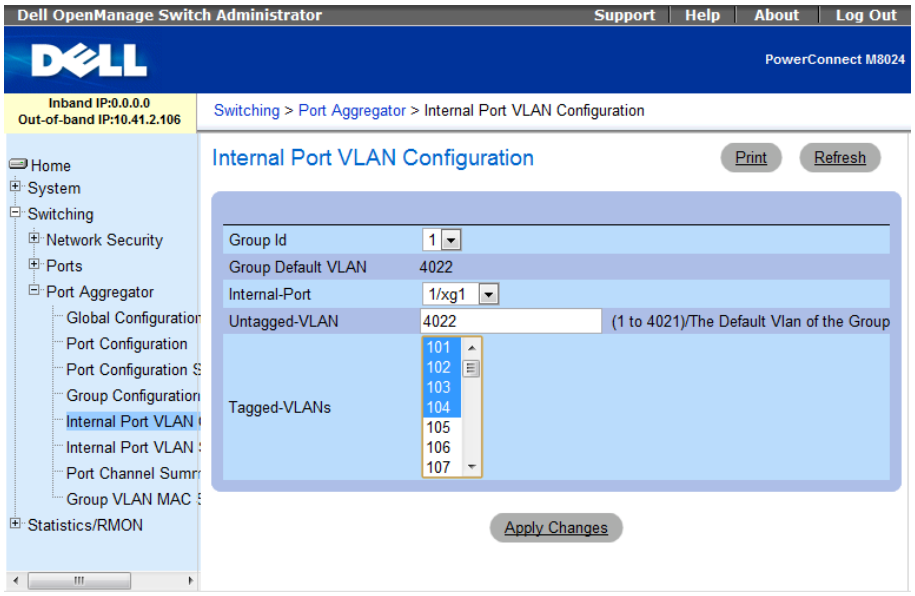

Figure 19: Selecting tagged VLANs in Internal Port VLAN Configuration on the Dell PowerConnect M8024 switch.

On the Cisco Nexus 5010 switch

1. Log into the switch.
2. Type the following commands into the switch (see Figure 20):

```
configure terminal
feature lacp
vlan 101-104
exit
interface port-channel 1
interface ethernet 1/1-4
channel-group 1 mode active
exit
switchport mode trunk
switchport trunk allowed vlan 101-104
end
```

```
cswitch1# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
cswitch1(config)# feature lacp
cswitch1(config)# vlan 101-104
cswitch1(config-vlan)# exit
cswitch1(config)# interface ethernet 1/1-4
cswitch1(config-if-range)# channel-group 1 mode active
cswitch1(config-if-range)# exit
cswitch1(config)# interface port-channel 1
cswitch1(config-if)# switchport mode trunk
cswitch1(config-if)# switchport trunk allowed vlan 101-104
cswitch1(config-if)# end
```

Figure 20: Configuring a port channel with Trunking and multiple VLANs on the Cisco Nexus 5010 switch.

3. Connect cables from the Cisco Nexus 5010 switch to the Dell PowerConnect M8024 switch. From this point onward, any VMs configured with VLAN tagging will be encapsulated with appropriate VLAN tags.

Scenario 4: Configuring multiple Port Aggregation Groups and dedicating specific Uplinks

On the Dell PowerConnect M8024 switch

1. Log into the switch.
2. Select System→Operational Mode→Operational Mode Configuration.
3. In the Operational Mode Configuration screen, select Enable in the Simple Mode drop-down menu and left-click Apply Changes (see Figure 21). The switch will reset after this and you will need to log in again.

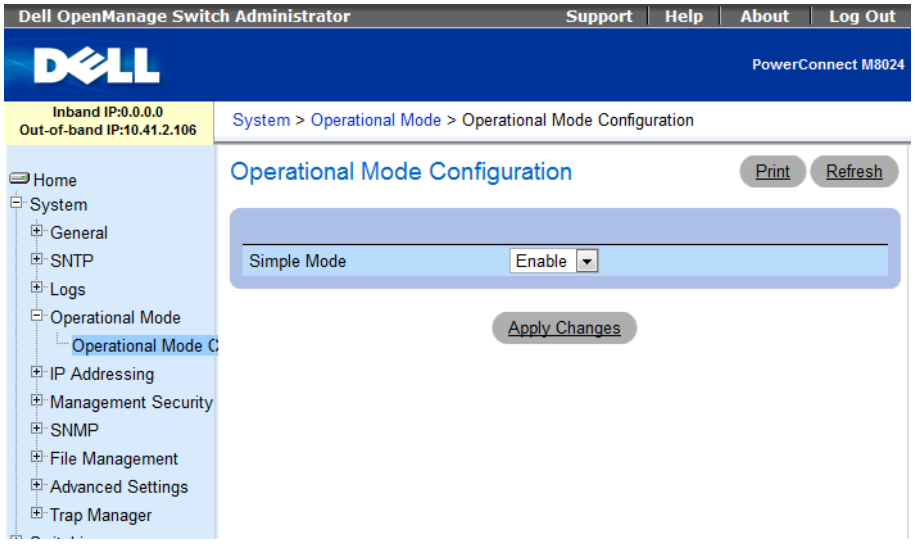

Figure 21: Simple Mode configuration on the Dell PowerConnect M8024 switch.

4. Select Switching→Port Aggregator→ Port Configuration (see Figure 22).

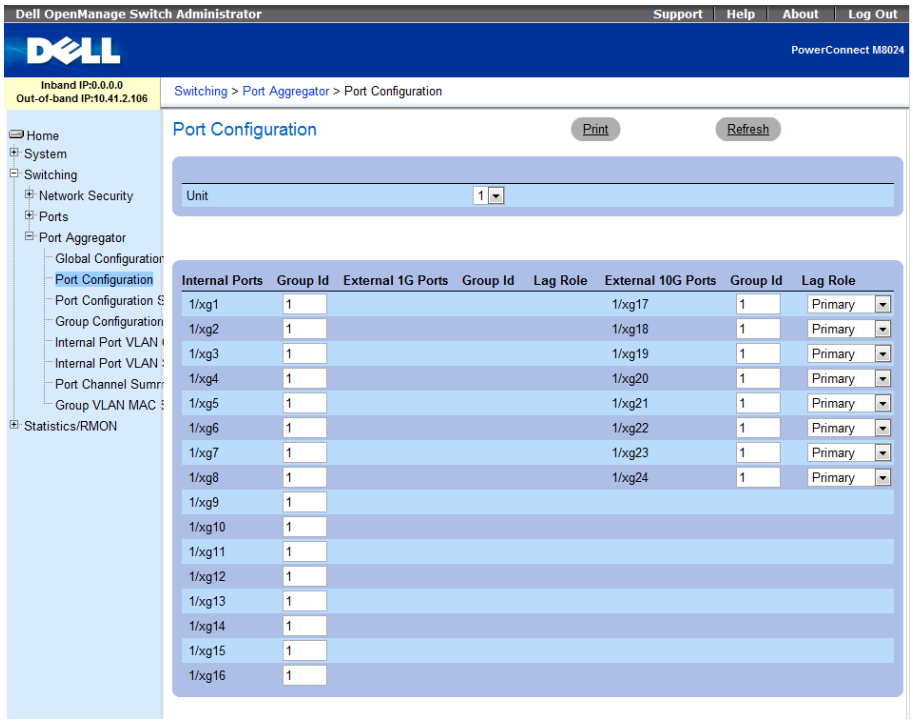

Figure 22: The Port Configuration screen on the Dell PowerConnect M8024 switch.

5. In the Port Configuration screen, change the Group ID of the internal ports (we changed ports 9-16 to Group 2). (See Figure 23.)

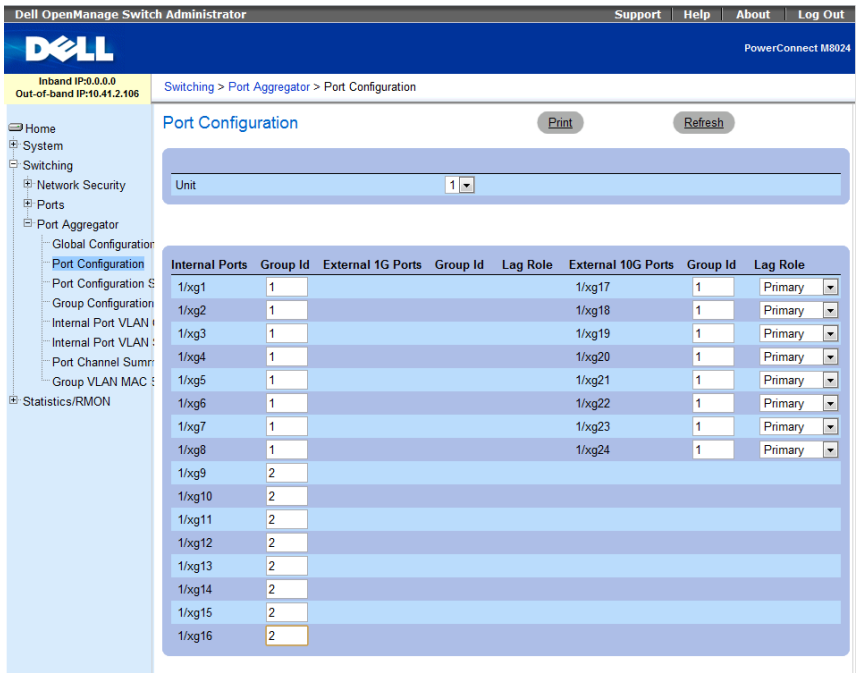

Figure 23: Assigning Group 2 to internal ports on the Dell PowerConnect M8024. switch.

6. In the Port Configuration screen, change the Group ID of the external ports (we changed ports 23 and 24 to Group 2), and click Apply Changes (see Figure 24).

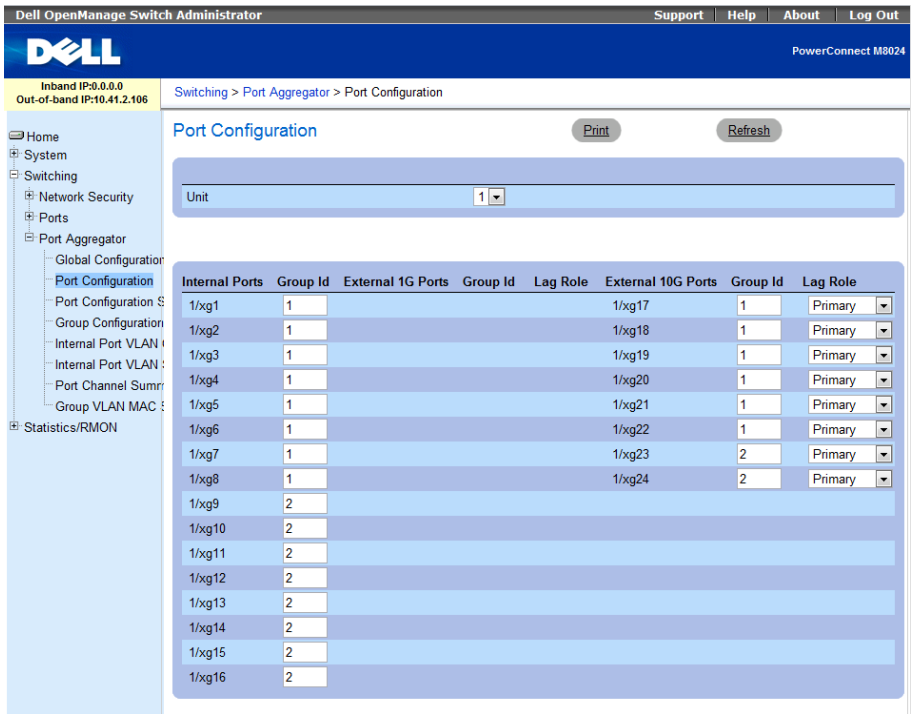

Figure 24: Assigning Group 2 to external ports on the Dell PowerConnect M8024 switch.

On the Cisco Nexus 5010 switch

1. Log into the switch.
2. Type the following commands into the switch to configure the first port channel (see Figure 25):

```
configure terminal
feature lacp
interface ethernet 1/1-2
channel-group 1 mode active
exit
```

```
cswitch1# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
cswitch1(config)# feature lacp
cswitch1(config)# interface ethernet 1/1-2
cswitch1(config-if-range)# channel-group 1 mode active
cswitch1(config-if-range)# exit
```

Figure 25: Configuring the first port channel on the Cisco Nexus 5010 switch.

3. Type the following commands into the switch to configure the second port channel (see Figure 26):

```
interface ethernet 1/3-4
channel-group 2 mode active
end
```

```
cswitch1# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
cswitch1(config)# feature lacp
cswitch1(config)# interface ethernet 1/3-4
cswitch1(config-if-range)# channel-group 1 mode active
cswitch1(config-if-range)# end
```

Figure 26: Configuring the second port channel on the Cisco Nexus 5010 switch.

4. Connect cables from the Cisco Nexus 5010 switch to the Dell PowerConnect M8024 switch. The Dell PowerConnect M8024 should automatically create two two-port LAGs, each configured with half of the internal ports.

Scenario 5: Adding VLANs in a multi-AG configuration

On the Dell PowerConnect M8024 switch

1. Log into the switch.
2. Select System→Operational Mode→Operational Mode Configuration.
3. In the Operational Mode Configuration screen, select Enable in the Simple Mode drop-down menu, and left-click Apply Changes (see Figure 27). The switch will reset after this and you will need to log in again.

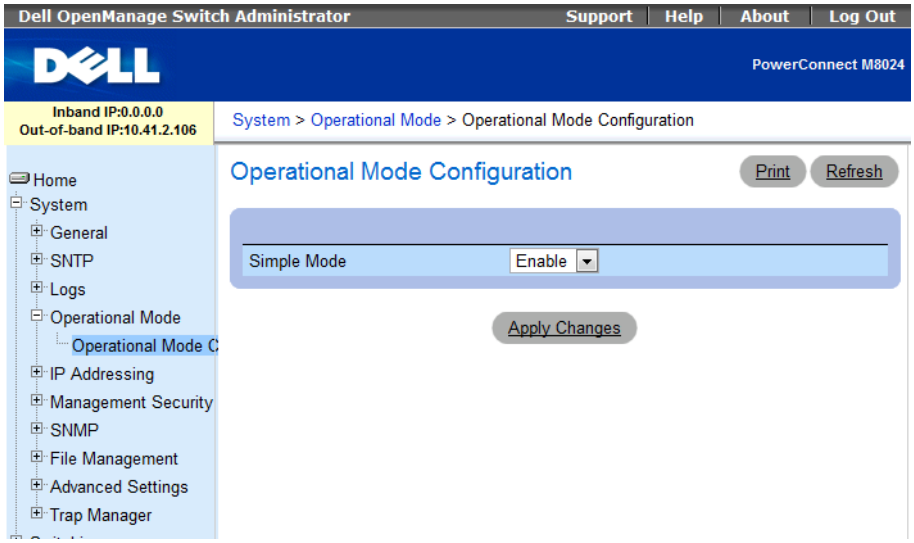

Figure 27: Simple Mode configuration on the Dell PowerConnect M8024 switch.

4. Select Switching→Port Aggregator→Port Configuration (see Figure 28).

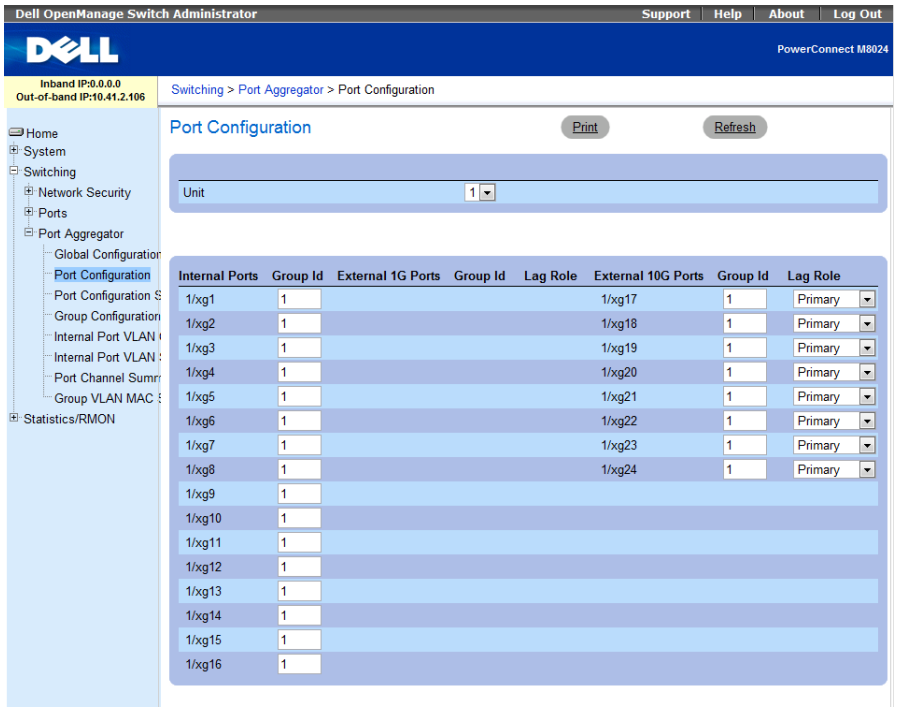

Figure 28: The Port Configuration screen on the Dell PowerConnect M8024 switch.

5. In the Port Configuration screen, change the Group ID of the internal ports (we changed ports 9 through 16 to Group 2). (See Figure 29.)

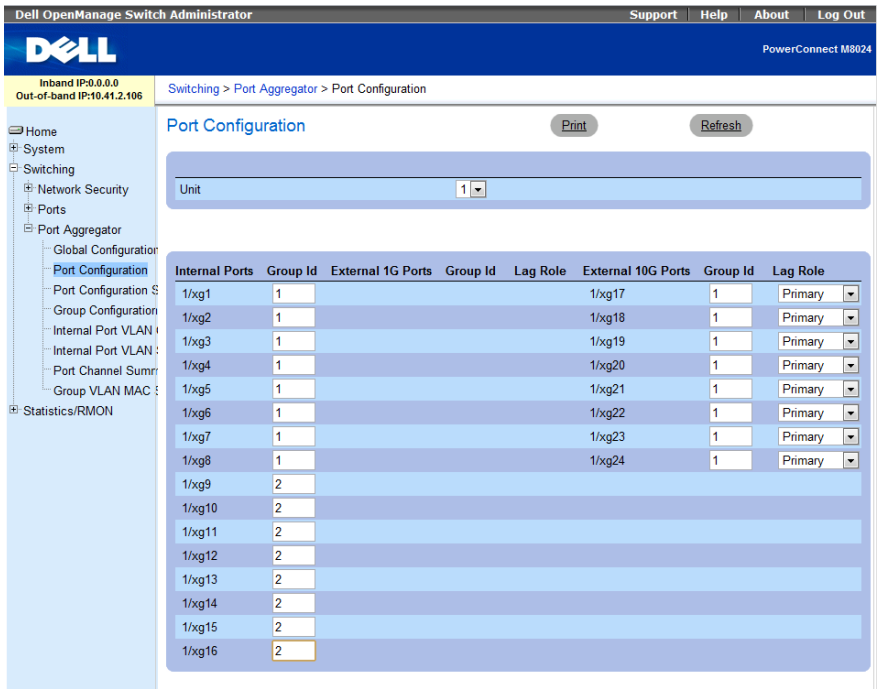

Figure 29: Assigning Group 2 to internal ports on the Dell PowerConnect M8024 switch.

6. In the Port Configuration screen, change the Group ID of the external ports (we changed ports 23 and 24 to Group 2), and click Apply Changes (see Figure 30).

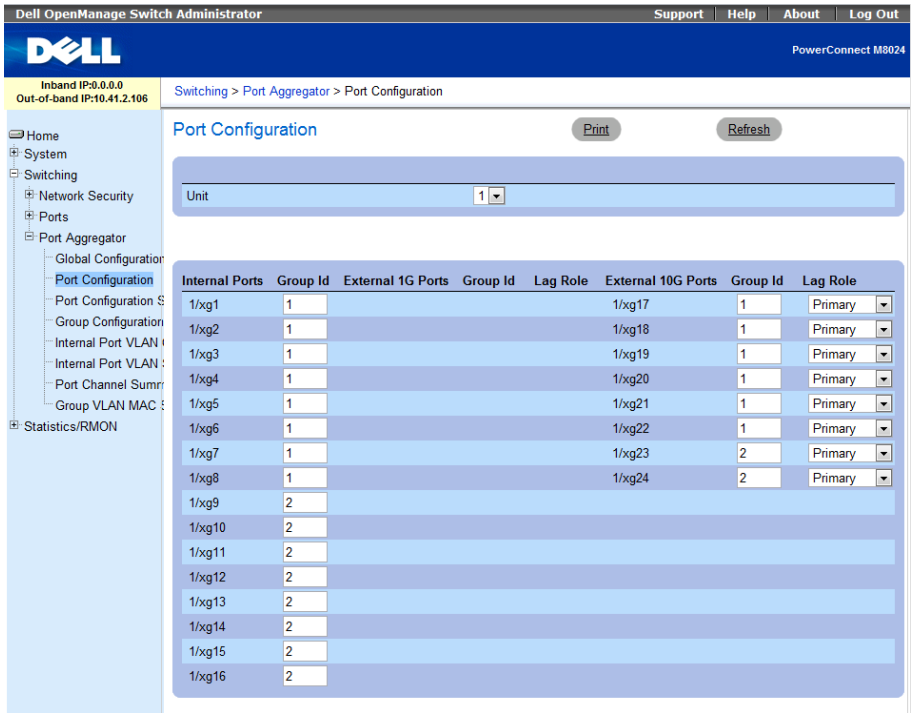

Figure 30: Assigning Group 2 to external ports on the Dell PowerConnect M8024 switch.

7. Select Switching→Port Aggregator→Internal Port VLAN Configuration (see Figure 31).

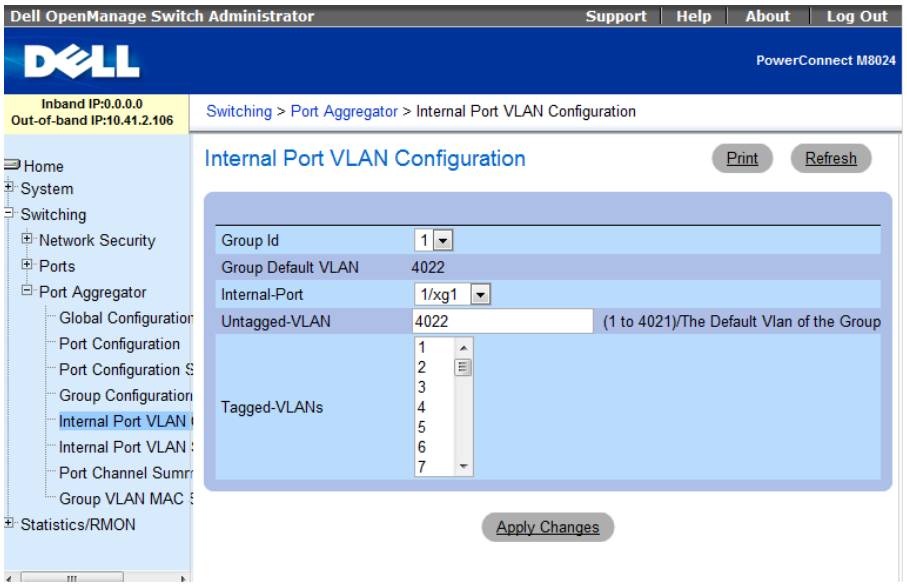

Figure 31: Internal Port VLAN Configuration on the Dell PowerConnect M8024 switch.

8. In the Internal Port drop-down menu, select a port (we chose 1/xg1).
9. In the Tagged-VLANs box, select your VLANs (we chose 101-102), and left-click Apply Changes (see Figure 32).

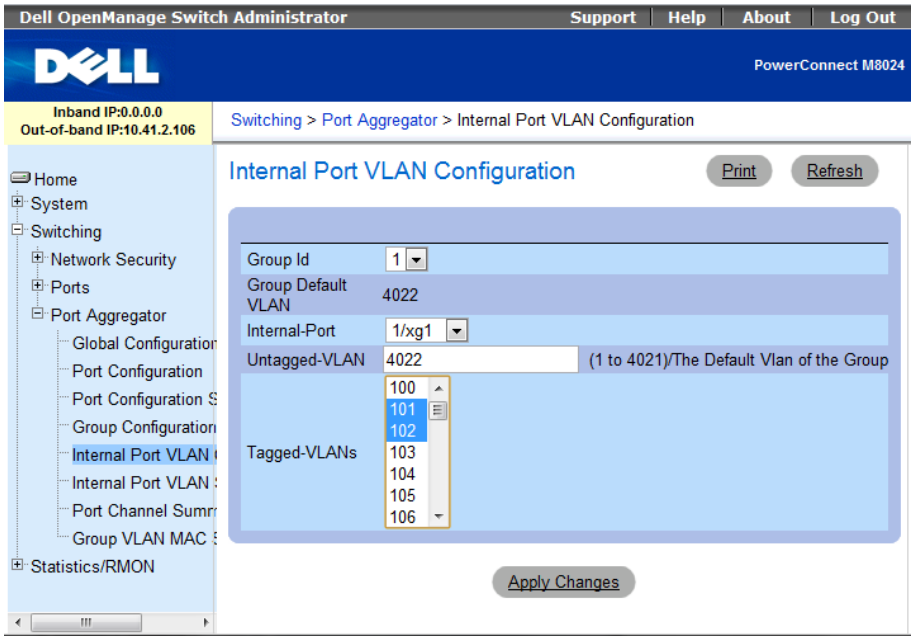

Figure 32: Selecting VLANs for the first port in Internal Port VLAN Configuration on the Dell PowerConnect M8024 switch.

10. Repeat step 9, applying VLANs 103-104 to port 1/xg9, (see Figure 33).

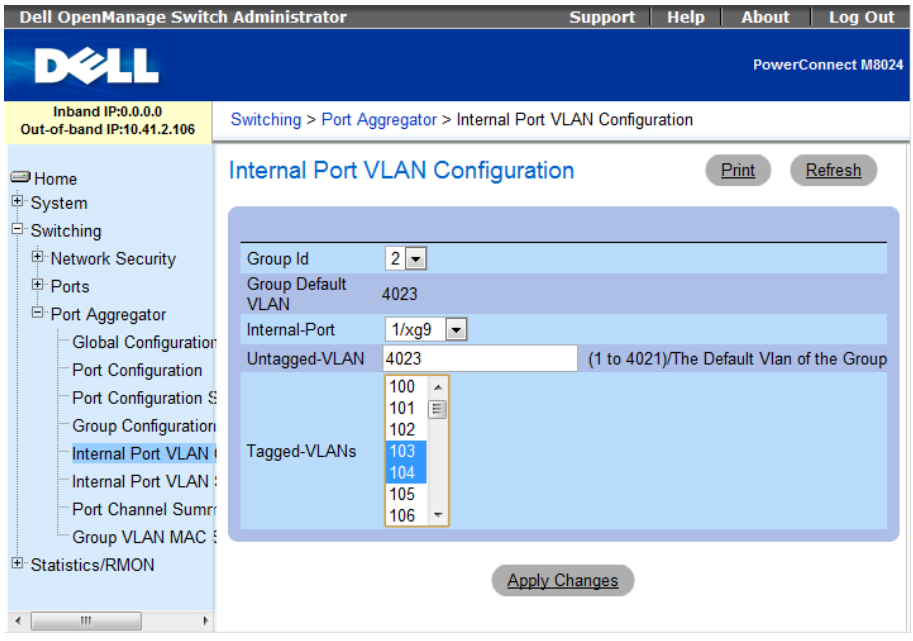

Figure 33: Selecting VLANs for the second port in Internal Port VLAN Configuration on the Dell PowerConnect M8024 switch.

On the Cisco Nexus 5010 switches

1. Log into the switch.
2. Type the following commands into your first Cisco Nexus 5010 switch (see Figure 34):

```
configure terminal
feature lacp
vlan 101-102
exit
interface ethernet 1/1-2
channel-group 1 mode active
exit
interface port-channel 1
switchport mode trunk
switchport trunk allowed vlan 101-102
end
```

```
cswitch1# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
cswitch1(config)# feature lacp
cswitch1(config)# vlan 101-102
cswitch1(config-vlan)# exit
cswitch1(config)# interface ethernet 1/1-2
cswitch1(config-if-range)# channel-group 1 mode active
cswitch1(config-if-range)# exit
cswitch1(config)# interface port-channel 1
cswitch1(config-if)# switchport mode trunk
cswitch1(config-if)# switchport trunk allowed vlan 101-102
cswitch1(config-if)# end
```

Figure 34: Configuring a port channel with Trunking and multiple VLANs on the first Cisco Nexus 5010 switch.

3. Type the following commands into your second Cisco Nexus 5010 switch (see Figure 35):

```
configure terminal
feature lacp
vlan 103-104
exit
interface ethernet 1/1-2
channel-group 1 mode active
exit
interface port-channel 1
switchport mode trunk
switchport trunk allowed vlan 103-104
end
```

```
cswitch2# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
cswitch2(config)# feature lacp
cswitch2(config)# vlan 103-104
cswitch2(config-vlan)# exit
cswitch2(config)# interface ethernet 1/1-2
cswitch2(config-if-range)# channel-group 1 mode active
cswitch2(config-if-range)# exit
cswitch2(config)# interface port-channel 1
cswitch2(config-if)# switchport mode trunk
cswitch2(config-if)# switchport trunk allowed vlan 103-104
cswitch2(config-if)# end
```

Figure 35: Configuring a port channel with Trunking and multiple VLANs on the second Cisco Nexus 5010 switch.

4. Connect cables from the Cisco Nexus 5010 switch to the Dell PowerConnect M8024 switch.

Scenario 6: Setting up a fully meshed topology

On the Dell PowerConnect M8024 switches

1. Log into Switch 1.
2. Select System→Operational Mode→Operational Mode Configuration.
3. In the Operational Mode Configuration screen, select Enable in the Simple Mode drop-down menu, and left-click Apply Changes (see Figure 36).

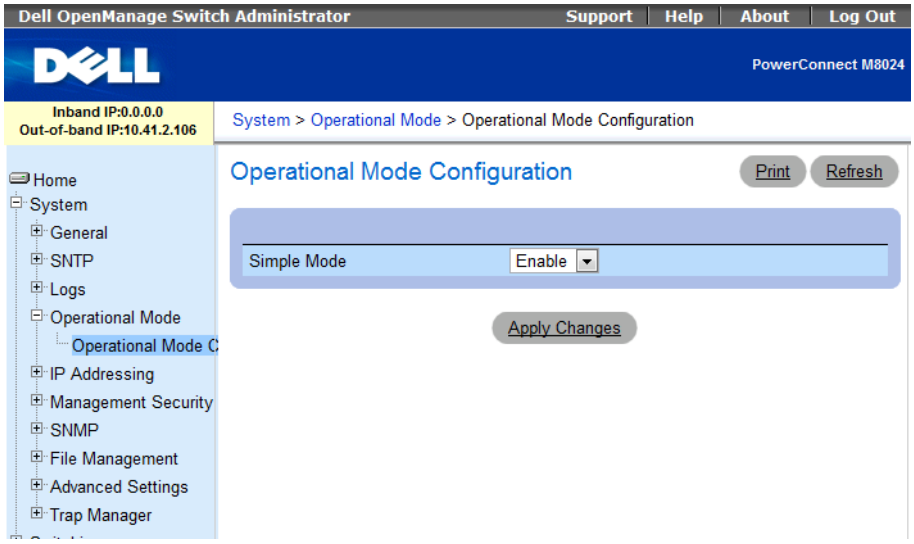

Figure 36: Simple Mode configuration on the Dell PowerConnect M8024 switch.

4. Log into Switch 2.
5. Select System→Operational Mode→Operational Mode Configuration.

6. In the Operational Mode Configuration screen, select Enable in the Simple Mode drop-down menu, and left-click Apply Changes (see Figure 37).

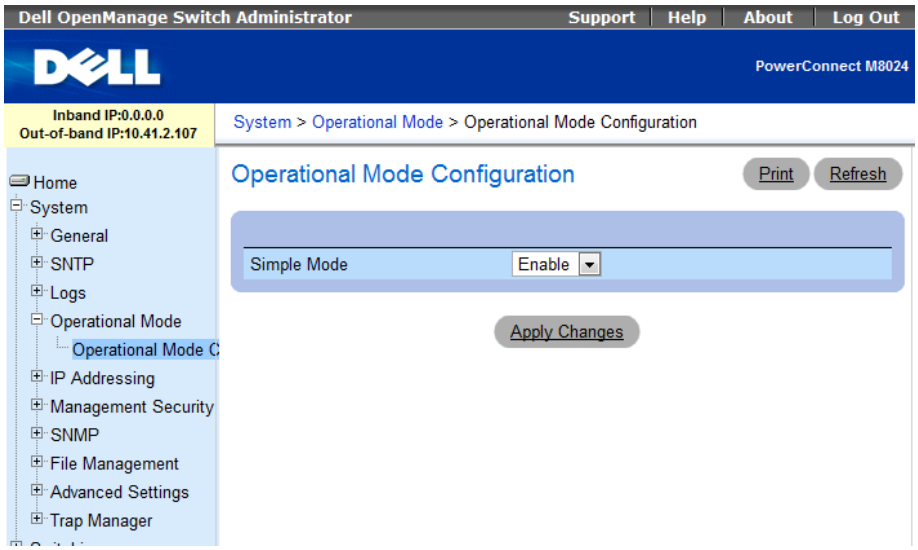

Figure 37: Simple Mode configuration on the second Dell PowerConnect M8024 switch.

On the Cisco Nexus 5010 switches

1. Log into the switch.
2. Type the following commands into the first Cisco Nexus 5010 switch (see Figure 38):

```
configure terminal
spanning-tree vlan 1-4094 priority 0
```

```
cswitch1# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
cswitch1(config)# spanning-tree vlan 1-4094 priority 0
```

Figure 38: Configuring spanning tree priority on the first Cisco Nexus 5010 switch.

3. Type the following commands into the second Cisco Nexus 5010 switch (see Figure 39):

```
configure terminal
spanning-tree vlan 1-4094 priority 4096
```

```
cswitch2# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
cswitch2(config)# spanning-tree vlan 1-4094 priority 4096
```

Figure 39: Configuring spanning tree priority on the second Cisco Nexus 5010 switch.

4. Connect the cables from the Cisco Nexus 5010 switches to each other and to the Dell PowerConnect M8024 switches. The

switches will deliberate amongst themselves and create a spanning tree with the first Cisco switch as the root.

Scenario 7: Setting up a straight-through topology with LAG failover

On the Dell PowerConnect M8024 switch

1. Log into the switch.
2. Select System→Operational Mode→Operational Mode Configuration.
3. In the Operational Mode Configuration screen, select Enable in the Simple Mode drop-down menu, and left-click Apply Changes (see Figure 40). The switch will reset after this and you will need to log in again.

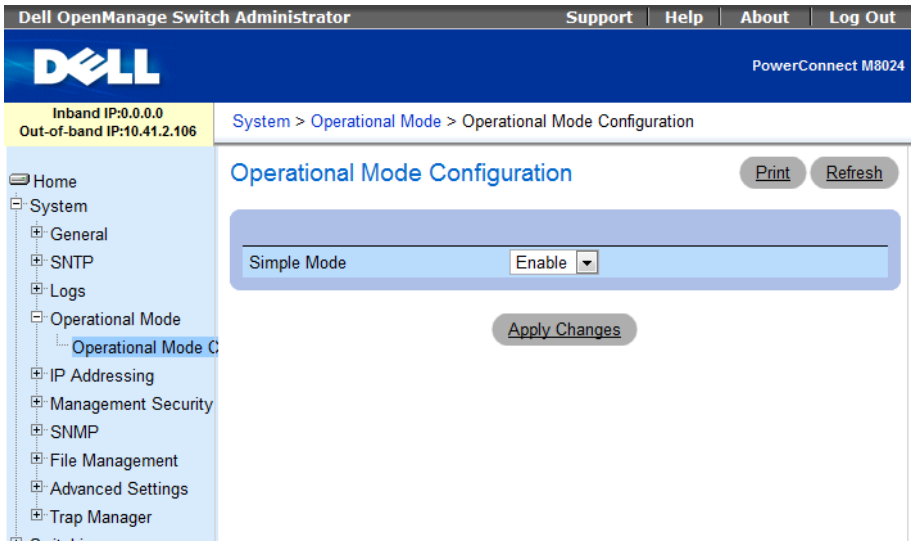

Figure 40: Simple Mode configuration on the Dell PowerConnect M8024 switch.

4. Select Switching→Port Aggregator→Port Configuration (see Figure 41).

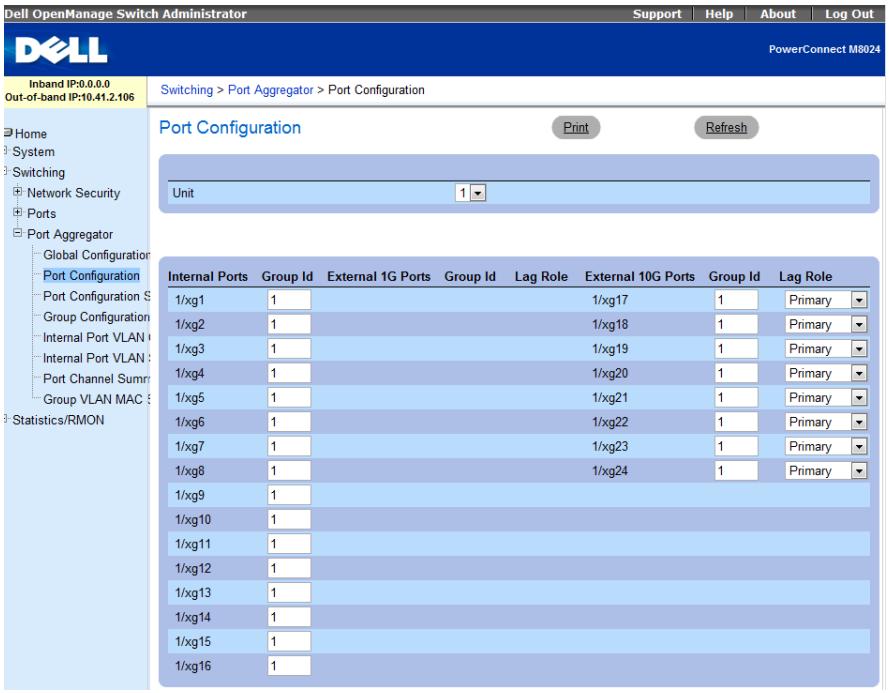

Figure 41: The Port Configuration screen on the Dell PowerConnect M8024 switch.

5. In the Port Configuration screen, change the Lag Role of the external ports (we changed ports 23 and 24 to Secondary), and click Apply Changes (see Figure 42).

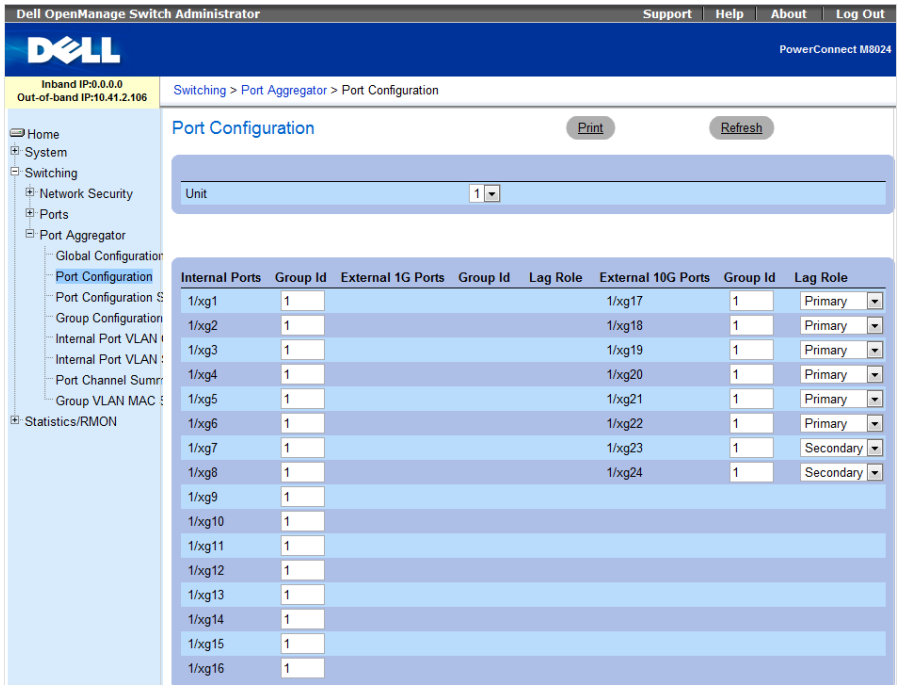

Figure 42: Assigning a Secondary LAG to external ports on the Dell PowerConnect M8024 switch.

On the Cisco Nexus 5010 switch

1. Log into the switch.
2. Assuming that you configured the Dell PowerConnect M8024 with three different groups, type the following commands into the switch (see Figure 43):

```
configure terminal
feature lacp
interface port-channel 1-2
exit
interface ethernet 1/1-2
channel-group 1 mode active
exit
interface ethernet 1/3-4
channel-group 2 mode active
end
```

```
cswitch1# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
cswitch1(config)# feature lacp
cswitch1(config)# interface ethernet 1/1-2
cswitch1(config-if-range)# channel-group 1 mode active
cswitch1(config-if-range)# exit
cswitch1(config)# interface ethernet 1/3-4
cswitch1(config-if-range)# channel-group 1 mode active
cswitch1(config-if-range)# end
```

Figure 43: Configuring two port channels on the Cisco Nexus 5010 switch.

3. Connect cables from the Cisco Nexus 5010 switch to the Dell PowerConnect M8024 switch. The Dell PowerConnect M8024 should automatically create one two-port LAG with a two-port backup in case of cable or port failure.

Scenario 8: Establishing access with vPC enabled across the Cisco Nexus 5010 switches

On the Dell PowerConnect M8024 switch

1. Log into the switch.
2. Select System→Operational Mode→Operational Mode Configuration.
3. In the Operational Mode Configuration screen, select Enable in the Simple Mode drop-down menu, and left-click Apply Changes (see Figure 44). The switch will reset after this and you will need to log in again.

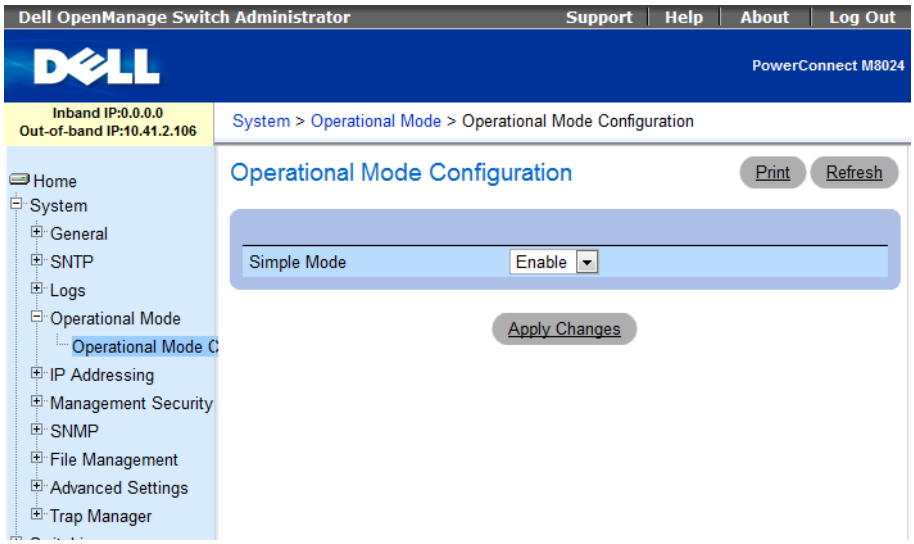

Figure 44: Simple Mode configuration on the Dell PowerConnect M8024 switch.

4. Select Switching→Port Aggregator→Internal Port VLAN Configuration.
5. In the Internal-Port drop-down menu, select a port (we chose 1/xg1). (See Figure 45.)

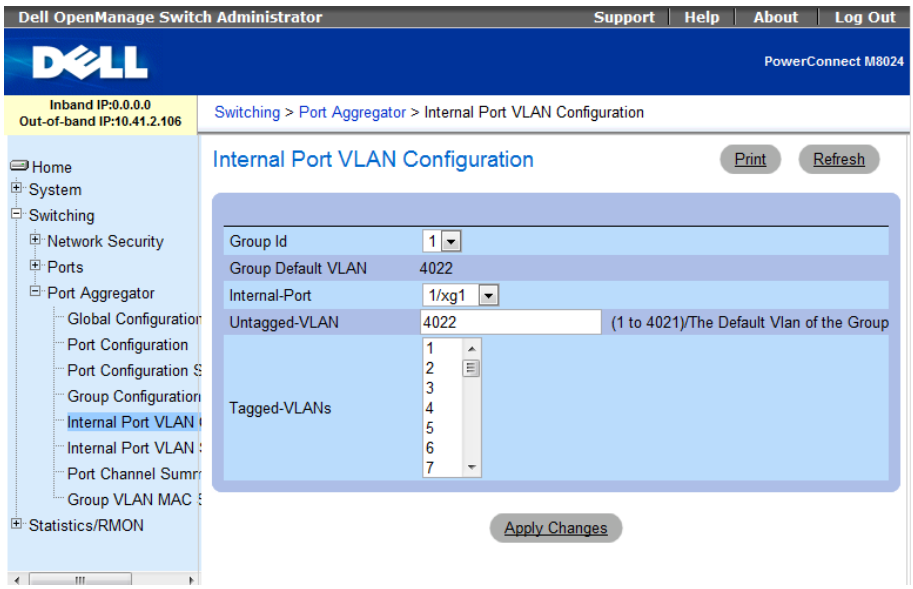

Figure 45: Internal Port VLAN Configuration on the Dell PowerConnect M8024 switch.

6. In the Untagged-VLAN textbox, write a VLAN (we chose 101), and left-click Apply Changes (see Figure 46).

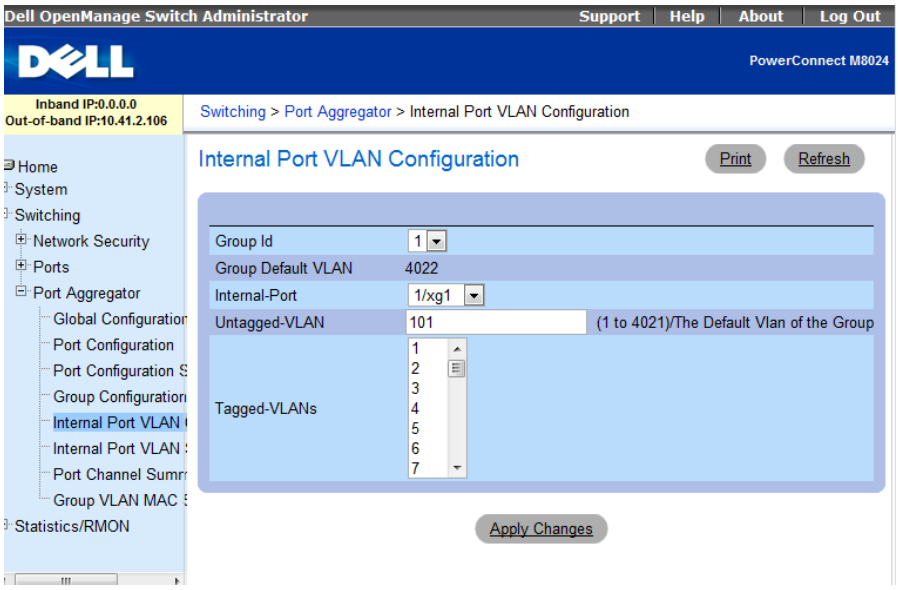

Figure 46: Selecting a VLAN in Internal Port VLAN Configuration on the Dell PowerConnect M8024 switch.

On the Cisco Nexus 5010 switch

1. Log into the switch.
2. Type the following commands into the first Cisco Nexus 5010 switch (see Figure 47):

```
configure terminal
feature lacp
feature vpc
vlan 101
exit
vpc domain 1
peer-keepalive destination 172.185.1.2
exit
interface ethernet 1/19-20
channel-group 1 mode active
exit
interface ethernet 1/1-2
channel-group 10 mode active
exit
interface ethernet 1/3-4
channel-group 11 mode active
exit
```

```
cswitch1# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
cswitch1(config)# feature lacp
cswitch1(config)# feature vpc
cswitch1(config)# vlan 101
cswitch1(config-vlan)# exit
cswitch1(config)# vpc domain 1
cswitch1(config-vpc-domain)# peer-keepalive destination 172.185.1.2
Note:
 --------:: Management VRF will be used as the default VRF ::--------
cswitch1(config-vpc-domain)# exit
cswitch1(config)# interface ethernet 1/19-20
cswitch1(config-if-range)# channel-group 1 mode active
cswitch1(config-if-range)# exit
cswitch1(config)# interface ethernet 1/1-2
cswitch1(config-if-range)# channel-group 10 mode active
cswitch1(config-if-range)# exit
cswitch1(config)# interface ethernet 1/3-4
cswitch1(config-if-range)# channel-group 11 mode active
cswitch1(config-if-range)# exit
```

Figure 47: Initial configuration and assigning ports to port channels on the first Cisco Nexus 5010 switch.

3. Type the following commands into the first Cisco Nexus 5010 switch (see Figure 48):

```
interface port-channel 1
switchport mode trunk
switchport trunk allowed vlan 1,101
vpc peer-link
spanning-tree port type network
exit
interface port-channel 10
switchport mode trunk
switchport trunk allowed vlan 101
vpc 10
exit
interface port-channel 11
switchport mode trunk
switchport trunk allowed vlan 101
vpc 11
end
```

```
cswitch1(config)# interface port-channel 1
cswitch1(config-if)# switchport mode trunk
cswitch1(config-if)# switchport trunk allowed vlan 1,101
cswitch1(config-if)# vpc peer-link
Please note that spanning tree port type is changed to "network" port type on vP
C peer-link.
This will enable spanning tree Bridge Assurance on vPC peer-link provided the ST
P Bridge Assurance
(which is enabled by default) is not disabled.
cswitch1(config-if)# exit
cswitch1(config)# interface port-channel 10
cswitch1(config-if)# switchport mode trunk
cswitch1(config-if)# switchport trunk allowed vlan 101
cswitch1(config-if)# vpc 10
cswitch1(config-if)# exit
cswitch1(config)# interface port-channel 11
cswitch1(config-if)# switchport mode trunk
cswitch1(config-if)# switchport trunk allowed vlan 101
cswitch1(config-if)# vpc 11
cswitch1(config-if)# end
```

Figure 48: Configuring port channels and assigning vPC domains on the first Cisco Nexus 5010 switch.

4. Type the following commands into the second Cisco Nexus 5010 switch (see Figure 49):

```
configure terminal
feature lacp
feature vpc
vlan 101
exit
vpc domain 1
peer-keepalive destination 172.185.1.1
exit
interface ethernet 1/19-20
channel-group 1 mode active
exit
interface ethernet 1/1-2
channel-group 10 mode active
exit
interface ethernet 1/3-4
channel-group 11 mode active
exit
```

```
cswitch2# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
cswitch2(config)# feature lacp
cswitch2(config)# feature vpc
cswitch2(config)# vlan 101
cswitch2(config-vlan)# exit
cswitch2(config)# vpc domain 1
cswitch2(config-vpc-domain)# peer-keepalive destination 172.185.1.1
Note:
 --------:: Management VRF will be used as the default VRF ::--------
cswitch2(config-vpc-domain)# exit
cswitch2(config)# interface ethernet 1/19-20
cswitch2(config-if-range)# channel-group 1 mode active
cswitch2(config-if-range)# exit
cswitch2(config)# interface ethernet 1/1-2
cswitch2(config-if-range)# channel-group 10 mode active
cswitch2(config-if-range)# exit
cswitch2(config)# interface ethernet 1/3-4
cswitch2(config-if-range)# channel-group 11 mode active
cswitch2(config-if-range)# exit
```

Figure 49: Initial configuration and assigning ports to port channels on the second Cisco Nexus 5010 switch.

5. Type the following commands into the second Cisco Nexus 5010 switch (see Figure 50):

```
interface port-channel 1
switchport mode trunk
switchport trunk allowed vlan 1,101
vpc peer-link
spanning-tree port type network
exit
interface port-channel 10
switchport mode trunk
switchport trunk allowed vlan 101
vpc 10
exit
interface port-channel 11
switchport mode trunk
switchport trunk allowed vlan 101
vpc 11
end
```

```
cswitch2(config)# interface port-channel 1
cswitch2(config-if)# switchport mode trunk
cswitch2(config-if)# switchport trunk allowed vlan 1,101
cswitch2(config-if)# vpc peer-link
Please note that spanning tree port type is changed to "network" port type on vP
C peer-link.
This will enable spanning tree Bridge Assurance on vPC peer-link provided the ST
P Bridge Assurance
(which is enabled by default) is not disabled.
cswitch2(config-if)# exit
cswitch2(config)# interface port-channel 10
cswitch2(config-if)# switchport mode trunk
cswitch2(config-if)# switchport trunk allowed vlan 101
cswitch2(config-if)# vpc 10
cswitch2(config-if)# exit
cswitch2(config)# interface port-channel 11
cswitch2(config-if)# switchport mode trunk
cswitch2(config-if)# switchport trunk allowed vlan 101
cswitch2(config-if)# vpc 11
cswitch2(config-if)# end
```

Figure 50: Configuring port channels and assigning vPC domains on the second Cisco Nexus 5010 switch.

6. Connect cables from the Cisco Nexus 5010 switch to the Dell PowerConnect M8024 switch according to the diagram shown in Scenario 8 of the Testing Scenarios section. Each Dell PowerConnect M8024 switch should automatically create a four-port LAG, with two ports connecting to each Cisco Nexus 5010 switch.

APPENDIX B – NETWORK SWITCH CONFIGURATION INFORMATION

Figure 51 provides detailed configuration information for the network switches we used.

Network switch	Dell PowerConnect M8024	Cisco Nexus 5010
Software version	3.1.3.12	4.1(3)N2(1)
BIOS version	—	1.3.0

Figure 51: Detailed configuration information for the network switches.

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